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TITLE: Telechemistry, Projecting Laboratory Expertise to a Deployed TAML

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CONTRACTING ORGANIZATION: U.S. Army Medical Research Institute of Chemical Defense
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6. AUTHOR(S)
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13. ABSTRACT (Maximum 200 Words)

The 520th Theater Army Medical Laboratory (TAML) is a unique Army asset with worldwide responsibility to deploy on short notice and conduct health surveillance as part of a comprehensive Force Health Protection Program. The TAML is staffed by permanent party enlisted and officers and augmented with Professional Filler System (PROFIS) officers upon deployment. The staff is required to set up, operate, maintain, and troubleshoot sophisticated, delicate, analytical equipment in a hostile environment. Training of TAML soldiers on analytical chemistry techniques is the joint responsibility of the U.S. Army Medical Research Institute of Chemical Defense (USAMRICD) and the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) who, collectively, possess the expertise needed by the TAML soldiers for analysis, data interpretation, troubleshooting, and consultation. However, implementing a comprehensive training plan has been undermined by routine deployments and the constant turnover of TAML personnel. We have addressed these issues using telemedicine technology to link the TAML to the experts in instrument operations and data analysis residing in these partnership units. The proposal was conducted in three phases; Equipment Procurement and Training, Proof of Concept, and Concept Validation. All tested scenarios met or exceeded established operating standards. By all measures the proposal was determined to be successful and to tremendously enhance the TAML's operational capability.

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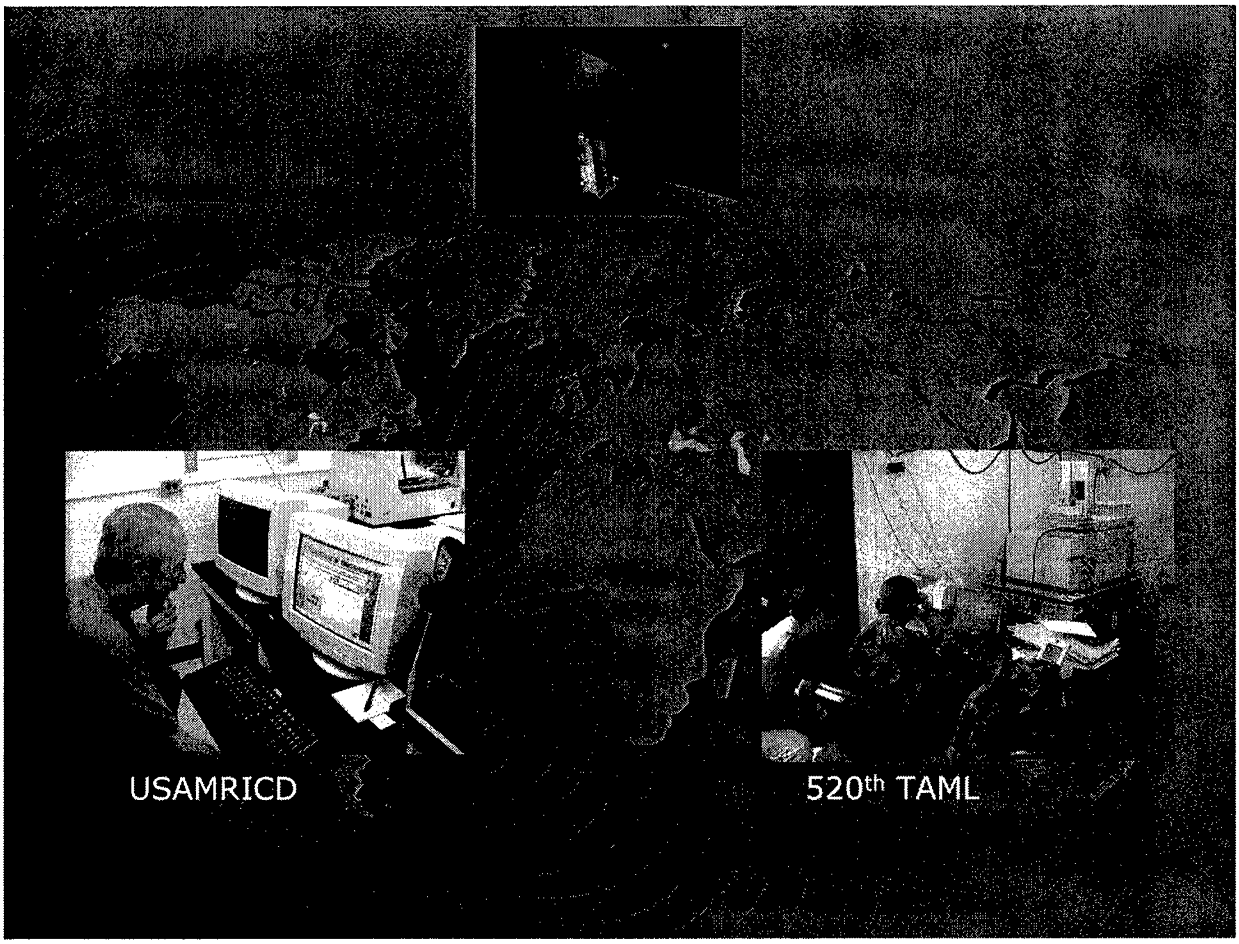
Table of Contents

Introduction:

The 520th Theater Army Medical Laboratory (TAML) is a unique Army asset with worldwide responsibility to deploy on short notice and conduct health surveillance as part of a comprehensive Force Health Protection Program. The TAML is staffed by permanent party enlisted and officers and augmented with Professional Filler System (PROFIS) officers upon deployment. The staff is required to set up, operate, maintain, and troubleshoot sophisticated, delicate, analytical equipment in a hostile environment. Training of TAML soldiers on analytical chemistry techniques is the joint responsibility of the U.S. Army Medical Research Institute of Chemical Defense (USAMRICD) and the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) who, collectively, possess the expertise needed by the TAML soldiers for analysis, data interpretation, troubleshooting, and consultation. However, implementing a comprehensive training plan has been undermined by routine deployments and the constant turnover of TAML personnel. We have addressed these issues through the application of telemedicine technology to a laboratory setting. The TATRC P8 Telemedicine Program provided the opportunity for funding of the proposal. Our submission, entitled "Telechemistry, projecting laboratory expertise to a deployed TAML". The technology provides the means to link the TAML to the experts in instrument operations and data analysis residing in the sponsoring units. The proposal was conducted in three phases; Equipment Procurement and Training, Proof of Concept, and Concept Validation. All tested scenarios met or exceeded established operating standards. By all measures the proposal was determined to be successful and tremendously enhanced the TAML's operational capability.



Body:

Our Telechemistry proposal was funded by the TATRC P8 Telemedicine program in FY 2003 and executed in three phases: equipment procurement and assembly, proof of concept and concept validation. Advancement to concept validation required successful completion of exit criteria for the previous phase. The duration of the proposal was projected to be 26 months (Appendix A).

The first phase, equipment procurement and assembly, included ordering, receipt, set-up and testing of individual components as well as assembly and training of personnel needed to accomplish this and subsequent phases. External contracting was minimized by leveraging the capabilities that exist within MEDCOM through the Telemedicine and Advanced Technology Research Center (TATRC) in the U.S. Army Medical Research and Material Command (USAMRMC). Exit criteria for the equipment assembly phase included: 1) Receipt of all necessary equipment to complete phase 1 and 2; 2) identification of personnel participating in the program; 3) completion of a comprehensive training program of all identified personnel; 4) and compatible.

The proof of concept phase included: 1) Video, voice and Gas Chromatography/Mass Spectrometry (GC/MS*) data transmission from Edgewood Area, Aberdeen Proving Ground, using updated International Maritime Satellite Terminals (INMARSAT), provided to the 520th TAML as part of the proposal and interfaced to their analytical equipment.

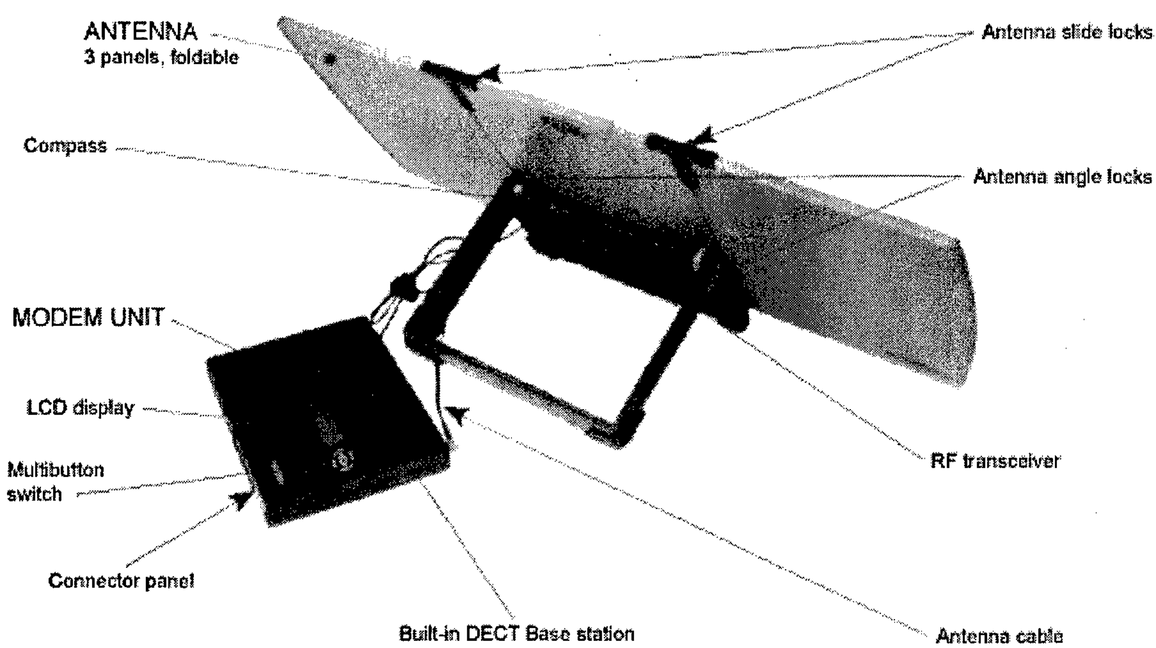


Fig. 1. INMARSAT base terminal

The Prototyping, Integration and Testing Laboratory (PITLAB)# at TATRC was used as the base station during the proof of concept phase; 2) Interpretation of normal data values/mass spectra for known compounds; 3) Remote instrument operation. The exit criteria for proof of concept included: 1) Preparation of written connectivity protocols for GC/MS data transmission

and remote instrument operation, 2) Remote selection and loading of methods, and 3) Remote troubleshooting and maintenance of system software and hardware to include, but not limited to, carrier gas/temperature adjustments, reference chromatogram library search and comparison, MS pump-down, tuning and data transfer and analysis.

The concept validation stage was based on the field deployment of the GC/MS system on a minimum of two exercises/operations. Duration and completion was dependent upon the deployment status of the TAML and the availability of personnel. It was expected that this phase would take approximately 9 months to complete bringing the duration of the program to 26 months. This phase was much shorter in duration than expected because the testing was limited to one exercise to expedite completion of the protocol due to unforeseen delays in previous phases which extended the length of the overall schedule. The exercise involved the identification of unknown chemical warfare agents, simulants and toxic industrial compounds (TICs) with the GC/MS. Scientists from USAMRICD and USACHPPM were required to provide voice, video, and data consultation, correction of software defects and recommendations to correct hardware deficiencies. Part I of the concept validation was similar to remote operations and data interpretation described in the proof of concept. Part II included the remote resolution/trouble shooting of the GC/MS system after intentional failures are introduced in the software and hardware. These failures included: 1) No reference library match for an unknown compound, 2) vacuum leaks and moisture in the MS, 3) analyte concentrations above or below the optimal, 4) resolution of overlapping chromatogram peaks, and 5) Operating systems failures. The successful remediation of >90% of the problems introduced in Parts I and II of the concept validation phase served as exit criteria for the study.

The technology required to perform a link-up as described was available commercially. Instrument manufacturer involvement was required to insure warranty violations were avoided and to gain input from manufacturers on interfacing issues.

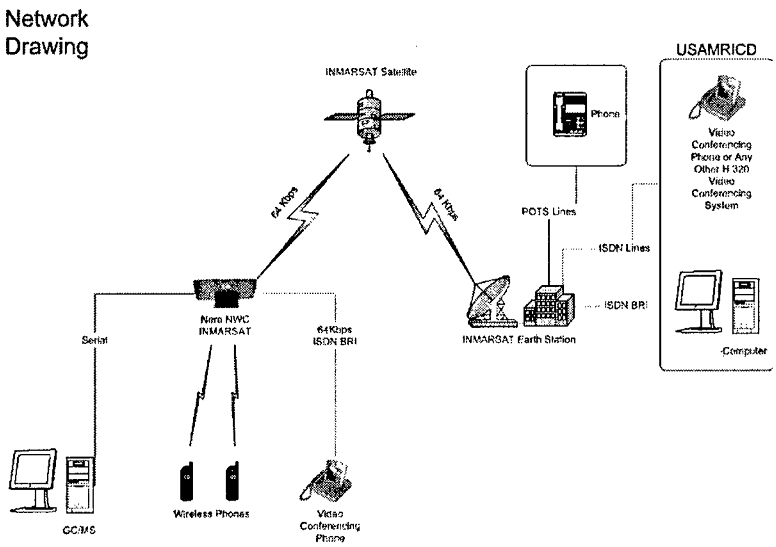


Fig. 2 Network diagram

* Gas Chromatography (GC)/ Mass Spectrometry (MS).

Gas chromatography is an analytical chemistry technique that is used to separate similar compounds present in a mixture. This separation is critical in order to effectively detect and quantify the individual compounds. Briefly, gas chromatography involves rapid vaporization and dissolving a sample containing a mixture of compounds in a gas stream

(such as hydrogen or helium) called the carrier gas and forced through a heated capillary column containing stationary phase. Compounds are retained by the stationary phase for different amounts of time based on the nature of their interaction with it, and therefore are separated from each other and can be identified and quantified with a detector.

Mass spectrometry is a powerful detection tool to identify compounds or elements and often used in conjunction with a GC (hence the name GC/MS). For GC/MS, the mass spectrometer converts individual organic compounds into rapidly moving gaseous ions and separates them by their mass to charge ratio to produce what is called a mass spectrum. Each compound has a characteristic mass spectrum, which can be identified and quantified when it is compared to mass spectra of standards made up of known compounds in known concentrations.

Among the most common set of compounds in environmental samples that can be analyzed by GC/MS are the volatile organic compounds (VOC). They are a subgroup of the larger family of organic compounds generated from natural resources such as forest fires, decomposition of organic materials or generated from human sources such as incinerators, industrial processes, the distribution, marketing, and use of gasoline, operation of motor vehicles, and evaporation of liquid fuels, solvents, and organic chemicals. These are potentially present as pollutants in water, air, and soil. The primary human health concerns vary from known carcinogens (such as benzene and vinyl chloride) to unknown health effects; some even contribute to atmospheric artifact formation such as ozone and acid rain. The second group is the semi-volatile organic compounds (SVOC) which are also generated from industrial operations and/or incomplete combustion products. There are 70 individually regulated compounds monitored as part of national environmental legislation, some of which are carcinogens and others are hazardous compounds. Finally, there are the polynuclear aromatics (PNA) which are formed during the incomplete burning of coal, gas, garbage, or other organic substances. These adsorb readily onto solid particles such as soil, dust, and soot. PNAs are among the most potent known human carcinogens that attack the liver (ingestion) and the lungs (inhalation).

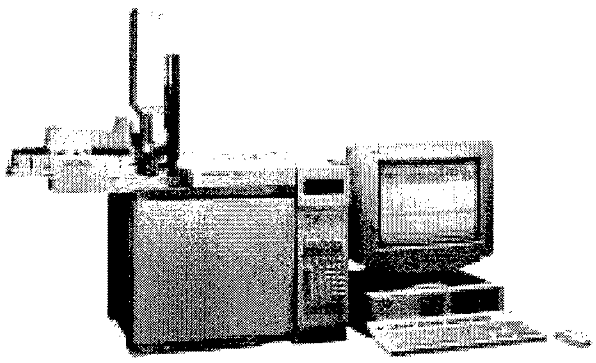


Fig. 3 *Agilent GC/MS system*

Prototyping, Integration and Testing Laboratory (PITLAB), is a DEPMEDS deployable hospital facility established for the integration & testing of advanced technologies in a simulated field environment. It has a compliment of space-based communications to include; Very Small Aperture Terminal Satellite (VSAT), and INMARSAT. In addition the PITLAB has a state of the art Wireless network, comprehensive communications suite, as well as a host of the latest electronics testing equipment.

Significance and/or Uniqueness of the Proposed Effort: The TAML is responsible for identifying the presence of chemical warfare (CW) agents and toxic industrial compounds with advanced analytical equipment, such as the gas-chromatograph-mass spectrometer (GC-MS)* in support of the MEDCOM force health protection mission. The TAML staff must be able to set up, operate, maintain, and troubleshoot this type of sophisticated delicate analytical equipment to provide quantitative analysis of environmental and biological samples in the field. They must be able to react to changing missions and variable sample matrices and be innovative enough to keep this equipment operating in a hostile environment. These operational and training needs were met by using telemedicine technology to project the experience and expertise of fixed facility personnel in CONUS to a deployed TAML. This was accomplished by combining real-time video and audio communications with on-line instrument communications allowing for remote analysis, troubleshooting, data interpretation, and software upgrades. This capability allows the TAML to deploy with the full support of experts in each field of study.

Our "Telechemistry" proposal parallels recent successful Telemedicine studies such as telepathology, teleradiology and telesurgery. The primary instrument configured for this proposal is the Agilent GC/MS which is already configured for remote operation utilizing LAN based connectivity. It is a logical step to determine if this remote operation could be accomplished with a wireless system connected through an existing satellite communication system. The use of portable GC/MS devices has gained popularity with industrial hygienists and more recently, with the emphasis on real-time analysis, in support of chemical/biological defense operations. The combination of portable GC/MS systems with remote communications and data devices provides a powerful new technology for the remote laboratory on the battlefield. Mr. Rick Smith, a USAMRICD staff member and co-investigator on this proposal, previously published on the value of Army Laboratory Telemedicine and the role of mass spectroscopy in telediagnosis for Chemical and Biological Defense. The Article appeared in the Journal of Toxicology, December, 2001 and stated, "The interaction between research scientists and field personnel in the acquisition of data and its interpretation via advanced digital telecommunication technologies can enhance rapid diagnosis and subsequently improve patient care in remote areas." This concept was the basis of our proposal.

This proposal is significant in that it serves as a "force multiplier" for a deployed field unit, responsible for force health protection and for providing the field commander with the information needed to make tactical decisions influenced by chemical and/or environmental threats. "Telechemistry" provides remote technical support and real-time data analysis and interpretation by subject matter experts (SMEs) from CONUS-based support units. Real-time technological assistance to the TAML in a deployed, potentially hostile environment, is unique to this proposal and essential to the success of the TAML's mission.

Potential Military Relevance: The data generated by the TAML is used to assist commanders in making tactical decisions. The TAML is our deployed laboratory platform designed to provide the field commander with the analytical information required to make decisions related to environmental safety and its effect on determining the appropriate level of protective posture, route of march, duration of stay, and risk assessment. The TAML also has the responsibility for confirming use of chemical or biological warfare agents in theater through analysis of biological and environmental samples. The work covered by this proposal directly supports Presidential Review Directive 5 (Force Health Protection Concept of Operations), DOD Directive 6490.2 (Joint Medical Surveillance), DOD Directive 6490.3 (Implementation and Application of Joint

Medical Surveillance for Deployments) and Allied Command Europe Directives 80-63 and 80-64 (ACE Policy for Defensive Measures against Low Level Radiological Hazards and Toxic Industrial Chemical Hazards during Military Operations).

Key Research Accomplishments:

DELIVERABLE: The deliverable of the Telechemistry proposal is to provide the capability to communicate, real-time, with a deployed military medical/environmental laboratory and assist them in the interpretation of complex data, troubleshoot equipment to maximize their up-time and provide a means of remotely operating their analytical equipment, if needed. In this way the proposal provides benefits in clinical-diagnostic, environmental assessment, disease prevention, forensic evaluation and administrative operations. We have met all deliverable criteria.

Reportable Outcomes:

a. Source Selection. A detailed source selection plan was developed and solicitations developed by the source selection committee convened by the PI in the summer of 2003. Three competing bids were selected for a demonstration. Though all the potential vendors met the minimum criteria for the proposal, the Telemedicinie and Advanced Technology Reasearch Center (TATRC) of USAMRMC offer was selected based on the simplicity of the plan, schedule, availability and cost.
b. Budget:
   i. The proposal was executed within the appropriated budget of $250,000.00
   ii. Detailed breakout:

Item	Description	Qty.		Cost	Extended Cost	
Tower computer	OptiPlex GX260T,3.06GHz,P4, 533FSB,512K Cache,Gray Small Minitower Base	2	$	1,203.00	$2,406.00	
ISDN Card	Eicon Diva Pro PCI ISDN Card	2	$	245.00	$490.00	
Net Support Software	Net Support Manager Version 8	6	$	87.00	$522.00	
INMARSAT Terminal	Nera World Communicator M4 INMARSAT Terminal with 1 DECT Handset	4	$	7,975.00	$31,900.00	
DECT Phone	Addtitional DECT Handset	4	$	332.00	$1,328.00	
Shipping	Shipping for INMARSAT Terminal and DECT Phone	1	$	122.00	$122.00	
VTC System	TeleVyou 511 ISDN Video Phone	4	$	1,149.00	$4,596.00	
Surge Protector	Belkin 8-Outlet SurgeMaster Maximum	4	$	24.00	$96.00	
Transit Case	Hardig (Approx)	4	$	624.00	$2,496.00	
Case Foam	Foam with cutouts for equipment (Approx)	4	$	-	$0.00	
Digital Camera	DSC-P72 Cyber-shot® Digital Camera	4	$	329.00	$1,316.00	
Camera Memory	Sony 128MB Memory Stick	4	$	69.99	$279.96	
Memory Reader	Sony MSAC-FD2MA Floppy Disk Adapter	4	$	73.00	$292.00	
	Sub-Total				**$45,843.96**	
TAML						
Contact svcs - 2500				$26,472.40		$26,472.40
Supplies - 2600				$8,293.28		$8,293.28
Equipment - 3100				$148,334.65	$45,721.96	$194,056.61
	Sub-Total			**$183,100.33**	**$45,721.96**	$228,822.29
	Grand Total			**$228,822.29**		

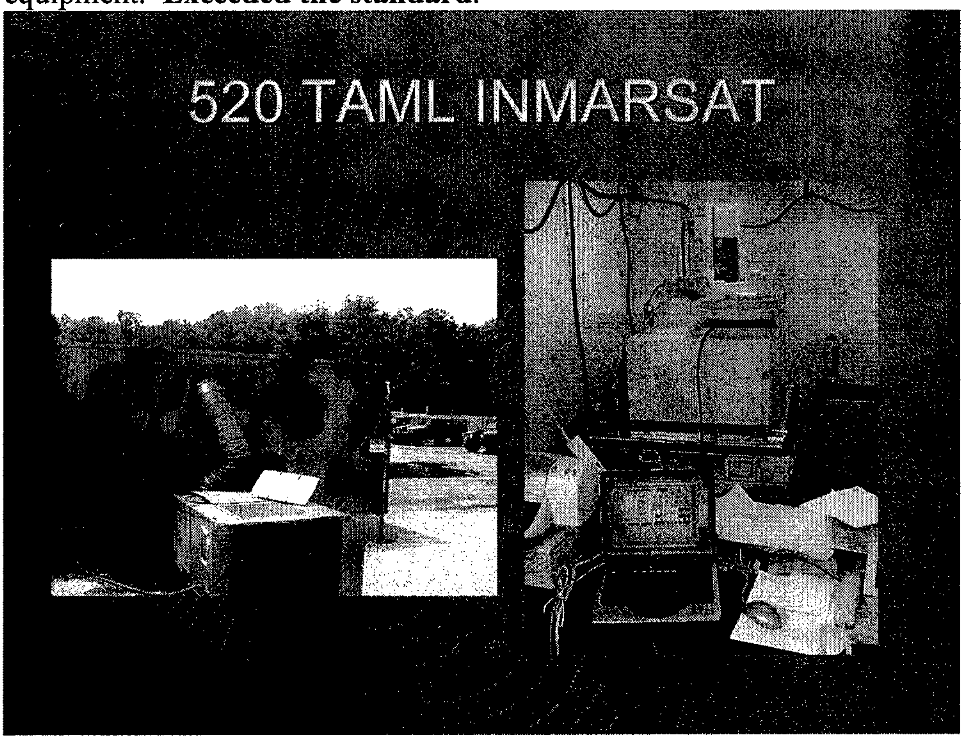
c. Performance: Success of the proposal was assessed in both the Proof of Concept and Concept Validation Phases.

   i. Proof of Concept qualitative assessment

      1. Does the lab/communication equipment interface work? **Yes**
      2. Does the communication equipment allow analytical equipment to interface and allow remote operators to see, real-time, what the local operator sees? **Yes**
      3. Can the remote operator see video images from the remote site in sufficient detail to assist the local operator in necessary functions? Yes
      4. Can the remote site take over operation of the equipment using networking software? **Yes**

   ii. Concept validation phase quantitative assessment

      1. Task: Set up the Iso-shelter with the telechemistry equipment.
         Condition: Provided the telemedicine list of equipment and placed in a field environment.
         Standard: With no additional time over standard operating set up time of the TAML Iso-shelter, integrate the set-up, establishment of communications with the rear and operations of the hardware associated with the telemedicine proposal and establish stable communications with no help from technical staff or observers.
         Results: Once the TAML was in place it took no longer than 30 min to establish a stable signal exceeding the minimum signal strength requirements to send voice, video or data via the INMARSAT. This added no time to the time normally required to establish communications and, in fact, improved set-up time because of the increased familiarity the staff gained with the equipment. **Exceeded the standard.**



2. Task: Correctly diagnose instrument malfunctions and rectify via voice/video link.
   Condition: Established communications with the rear, in a field environment. Equipment is inoperable precluding the use of any software interaction with the equipment.
   Standard: Within 2 hours, working with the assistance of experts at ICD, utilize all capabilities of the telemedicine link to conduct an organized troubleshooting process and correctly diagnose and correct problems resulting in operational equipment.

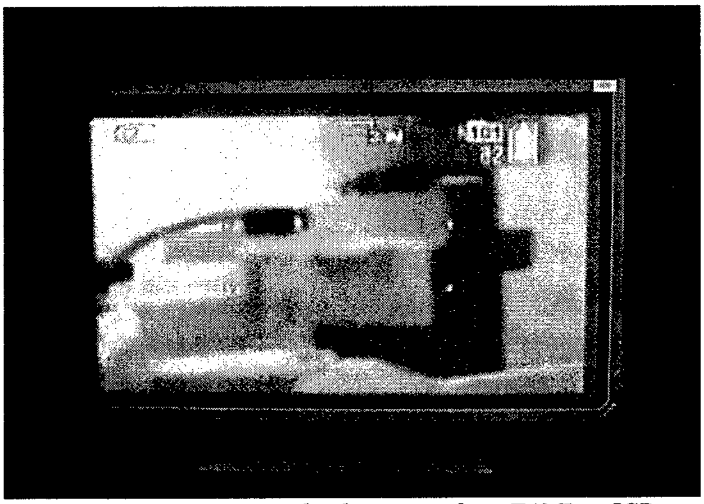
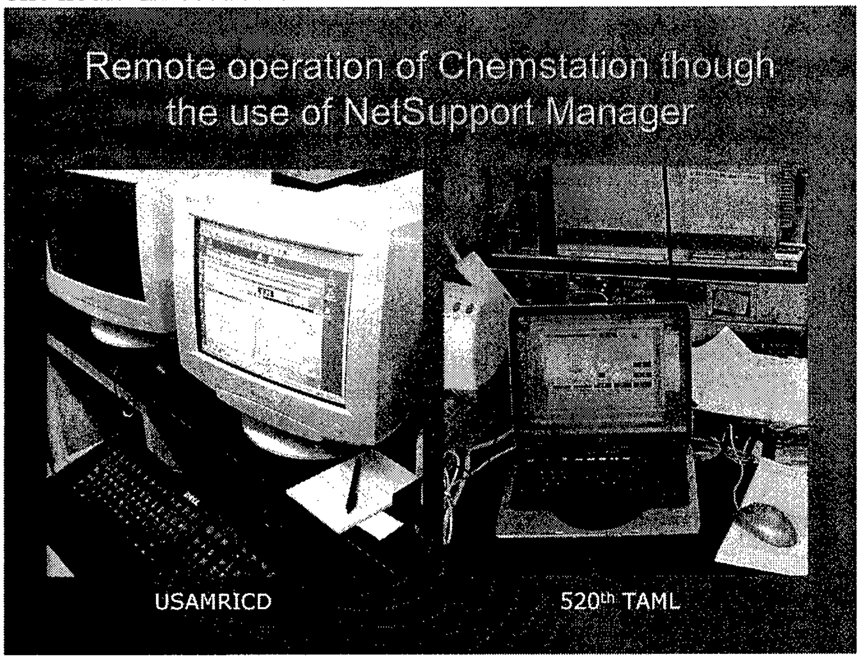


Fig 4. *Transmitted video image from TAML to ICD*

   Results: Problems were correctly identified and corrected within one hour using the digital camera and voice communications. **Exceeded the standard.**
3. Task: Correctly diagnose and rectify instrument operational problems using software.
   Condition: Established telemedicine communications, field environment, equipment operational but not meeting acceptable standards for analysis.
   Standard: Within 2 hours, working with the experts at ICD via telemedicine communications, and using the networking software allowing remote operation of the GC-MS equipment with the Chemware software package, correctly diagnose the problems with the equipment and perform corrective measures resulting in achievement of acceptable operational parameters.

Results: Problems were correctly diagnosed and rectified within one hour. **Exceeded the standard.**



4. Task: Correctly analyze and interpret an unknown.
   Condition: Established communications with the rear, field environment, equipment operating properly and is calibrated.
   Standard: Within 2 hours, prepare, analyze and interpret the data of an unknown sample taking advantage of expertise in the rear, if needed.
   Results: TAML team correctly identified the unknown provided and confirmed their result with assistance from the experts at ICD via the telechemistry link. Completed the task within the two ours allotted. **Met the standard.**
5. Task: With assistance from the remote site appropriately receive log, store, prepare, analyze and ship samples requiring a chain of custody.
   Condition: Established communications, field environment, equipment operating properly
   Standard: Within 2 hours of receipt, correctly process, log, prepare analyze, and prepare to ship a sample requiring chain of custody.
   Results: Task was not evaluated but OIC was very familiar with the procedure and had a working knowledge of the specimen submission manual available on the USAMRICD web site. Based on our evaluation of the previous tasks and the OIC familiarity with the policy I am confident that this task can be performed to standard.

Conclusions:

This proposal is an innovative approach to solving a serious problem in military medical readiness. The 520th TAML is the U.S. Army's forward deployed analytical platform designed to provide the area commander with environmental as well as medically relevant data that can dramatically effect the actions taken in a tactical environment. Routinely the TAML experienced problems with their equipment on deployments due to the fragility of the

equipment and the hostile operational environment. TAML personnel are capable operators but lack the experience to do in depth troubleshooting or perform complex specimen clean up or analysis. The TAML missions are complex and multifaceted ranging from assessing Toxic Industrial Chemicals (TICs) and materials (TIMs) in environmental samples to determining if a weapon of mass destruction has been used in theater. This is a very great responsibility to place on a young soldier with only a basic familiarity with the analytical equipment. Similar missions in CONUS based fixed facility laboratories are routinely staffed by Ph.D. level analytical chemists with decades of training and experience. The USACHPPM and the USAMRICD, both co-located at the Edgewood Area of Aberdeen Proving Ground with the 520th TAML, are two such laboratories and have the combined responsibility to ensure the TAML's equipment is well maintained and their personnel are adequately trained. Though much time and effort has been spent in trying to meet this obligation established programs were undermined by regular TAML deployments and personnel turn-over.

Our approach to meeting the training and maintenance shortfalls was to adapt telemedicine technology to our needs to communicate with TAML while deployed; to see what they see and to be able to take over the operation of the equipment, if necessary to accomplish their analytical mission. Remote instrument troubleshooting and operation is being used routinely by most national laboratory equipment manufactures to minimize the time spent by maintenance personnel on service calls. Our application to satellite communication is a relatively modest step forward and required little modification to existing equipment or communications systems in the TAML.

The proposal took advantage of the INMARSAT technology which allows the transmission of data, voice or video, using a series of stationary orbit satellites covering over 90% of the globe. Connections were relatively straight forward, similar to setting up a modem in your home. Laptops were already being used to operate the Gas Chromatograph analytical equipment so a mechanism to facilitate the connection already existed. Digital video phones to allow for video connections and Iridium phones to provide the means to conduct secure communications were provided to complete the complement of needed communication systems.

Probable situations were planned as part of a comprehensive evaluation of the system. As outlined above, the TAML and USAMRICD staff, using the equipment provided through the proposal, demonstrated the potential to improve instrument up-time and confirm the identity of complex samples. The objectives of the proposal were met and the value to the TAML and the Army as a whole, proven.

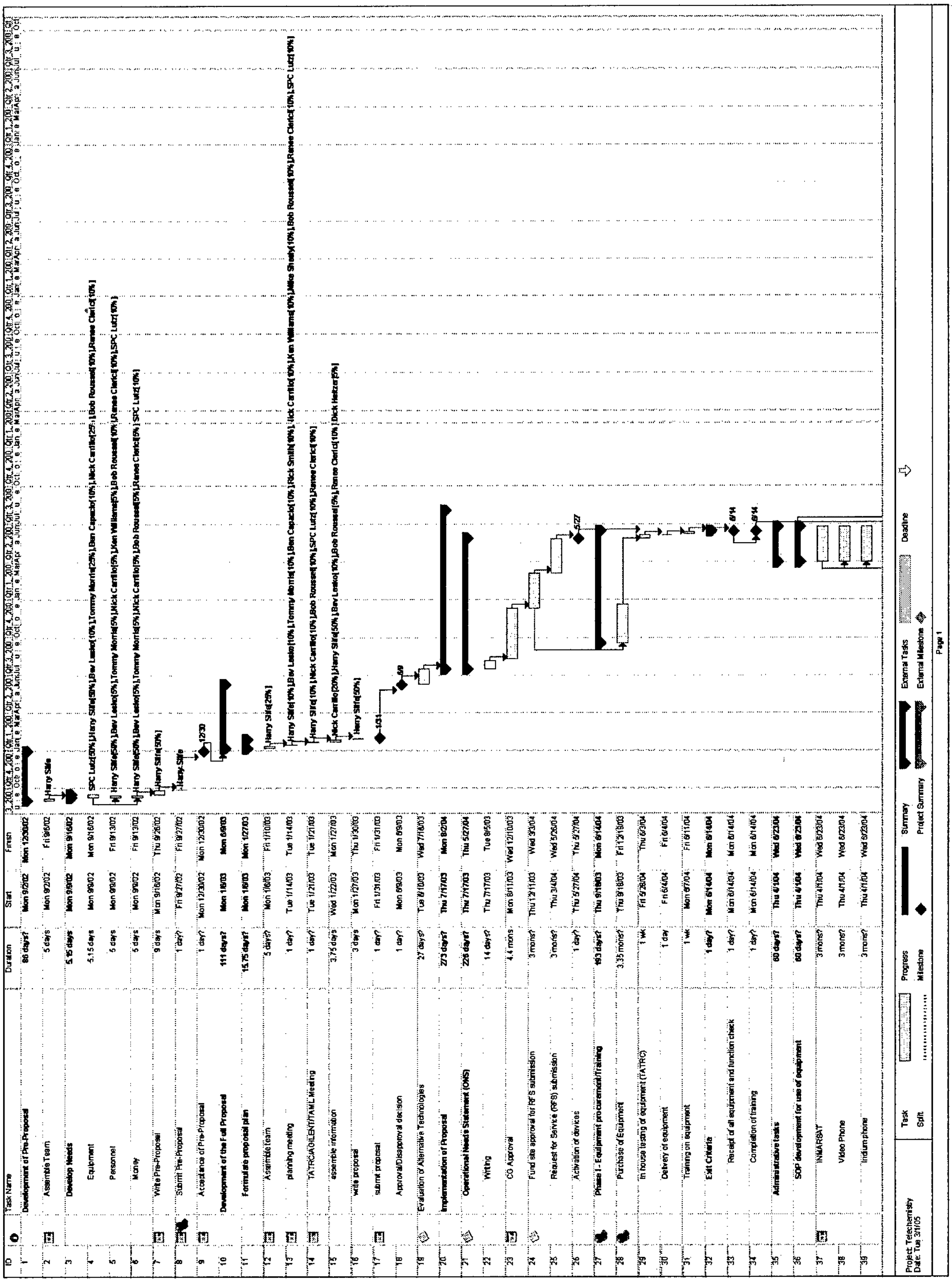
It is our recommendation that the AMEDD consider a broader application of telemedicine technology to assist in operation and maintenance roles as well as direct patient care. This study is consistent with the transformation initiatives at Army level and the "virtual hospital" concept pursued by MEDCOM. Future applications of this technology include the Mobile Analytical Laboratories (MALs) recently established by the National Guard for homeland defense. Opportunities to enhance current civilian operational capabilities and other military operations are also evident whenever assistance is required at remote sites, when limited on site support is available and complex operations are required.

References:

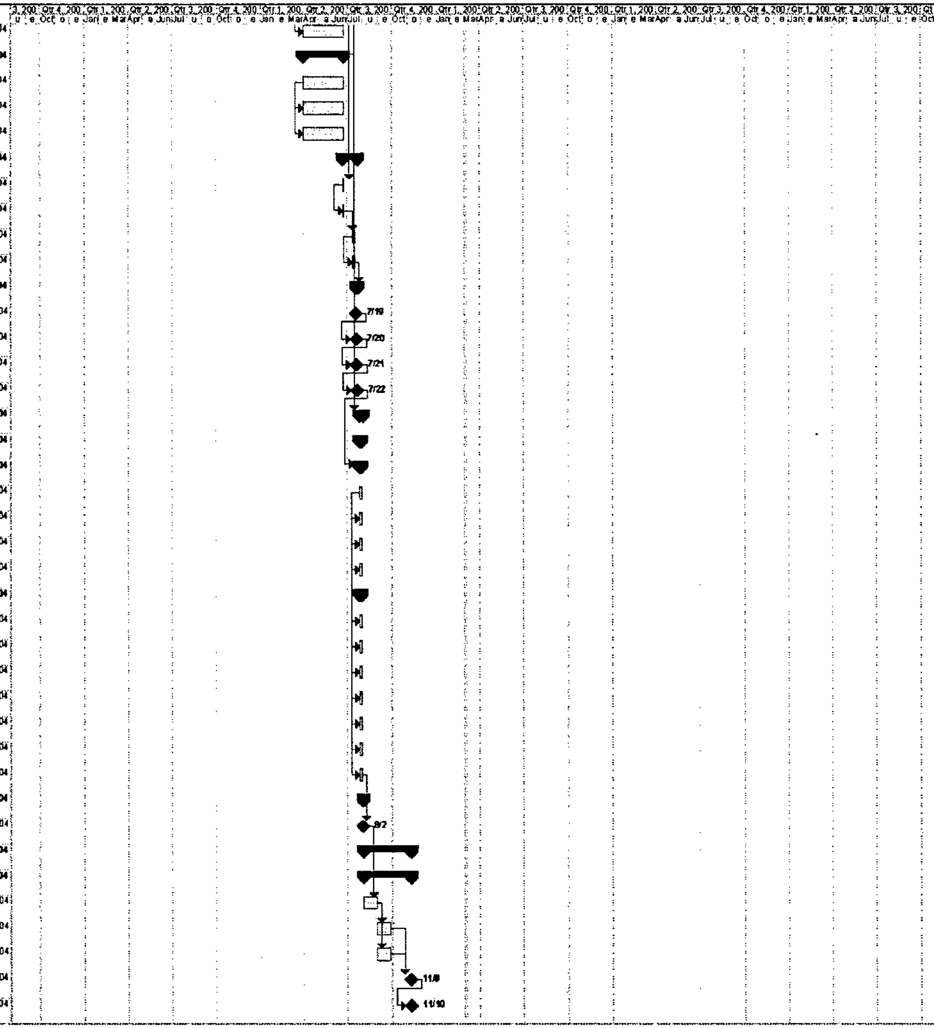
1. Smith, John R., The value of Army Laboratory Telemedicine and the Role of Mass Spectroscopy in Telediagnosis for Chemical and Biological Defense. Journal of Toxicology, December, 2001
2. TATRC P8 Telemedicine call for proposals, 2002

Appendices:

Appendix A. SCHEDULE:



ID	Task Name	Duration	Start	Finish
40	GC-MS Interface	3 mons?	Thu 4/1/04	Wed 6/23/04
41	**Development of testing standards for system**	**60 days?**	**Thu 4/1/04**	**Wed 6/23/04**
42	Troubleshooting	3 mons?	Thu 4/1/04	Wed 6/23/04
43	Remote operation	3 mons?	Thu 4/1/04	Wed 6/23/04
44	Consultation	3 mons?	Thu 4/1/04	Wed 6/23/04
45	**Phase II - Proof of Concept**	**23 days?**	**Tue 6/22/04**	**Thu 7/22/04**
46	Local tansmission of data	2 days?	Tue 6/22/04	Wed 6/23/04
47	Local tansmission of video and audio	2 days?	Tue 6/22/04	Wed 6/23/04
48	Data interpretation exercise (local)	1 wk?	Mon 7/12/04	Fri 7/16/04
49	remote operation of equipment (local)	1 wk?	Mon 7/12/04	Fri 7/16/04
50	**Exit criteria**	**4 days?**	**Mon 7/19/04**	**Thu 7/22/04**
51	Written connectivity protocols	1 day?	Mon 7/19/04	Mon 7/19/04
52	Demonstrated remote operation	1 day?	Tue 7/20/04	Tue 7/20/04
53	Selection and loading of methods	1 day?	Wed 7/21/04	Wed 7/21/04
54	Troubleshooting and maintenance	1 day?	Thu 7/22/04	Thu 7/22/04
55	**Phase III - Concept Validation**	**6 days?**	**Mon 7/26/04**	**Mon 8/2/04**
56	**Field Exercise**	**5 days?**	**Mon 7/26/04**	**Fri 7/30/04**
57	**Part I - Operation**	**5 days?**	**Mon 7/26/04**	**Fri 7/30/04**
58	Remote operation off of Edgewood area	1 wk?	Mon 7/26/04	Fri 7/30/04
59	ID of unkown samples	1 wk?	Mon 7/26/04	Fri 7/30/04
60	Loading of software	1 wk?	Mon 7/26/04	Fri 7/30/04
61	Transmission and receipt of data	1 wk?	Mon 7/26/04	Fri 7/30/04
62	**Part 2 - Problem resolution**	**5 days?**	**Mon 7/26/04**	**Fri 7/30/04**
63	Troubleshooting intentional failures introduced	1 wk?	Mon 7/26/04	Fri 7/30/04
64	No Library match	1 wk?	Mon 7/26/04	Fri 7/30/04
65	Vacuum leak	1 wk?	Mon 7/26/04	Fri 7/30/04
66	Moisture in the MS	1 wk?	Mon 7/26/04	Fri 7/30/04
67	Concentrations too high or low	1 wk?	Mon 7/26/04	Fri 7/30/04
68	Resolving overlapping peaks	1 wk?	Mon 7/26/04	Fri 7/30/04
69	Operating system failures	1 wk?	Mon 7/26/04	Fri 7/30/04
70	**Exit criteria**	**1 day?**	**Mon 8/2/04**	**Mon 8/2/04**
71	Successful resolution of greater than 80% of problem	1 day?	Mon 8/2/04	Mon 8/2/04
72	**Completion of Proposal**	**71 days**	**Tue 8/3/04**	**Tue 11/9/04**
73	**Team meeting**	**71 days**	**Tue 8/3/04**	**Tue 11/9/04**
74	Consolidation of assessments	1 mon	Tue 8/3/04	Mon 8/30/04
75	Write-up of results	1 mon	Tue 8/31/04	Mon 9/27/04
76	Write-up of lessons learned	1 mon	Tue 8/31/04	Mon 9/27/04
77	Submission of Report	1 day	Tue 11/9/04	Tue 11/9/04
78	Recommendation on Fielding	1 day?	Wed 11/10/04	Wed 11/10/04



Project: Telechemistry
Date: Tue 3/1/05

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

Appendix B. PROBLEMS ENCOUNTERED

a. Schedule. Due to the user unit (520th TAML) being deployed during Operation Iraqi Freedom, coordination time was lost. The unit has been refitting and is undergoing a planned reorganization since their return. Appropriately, this protocol has not been high on the unit priority list. This resulted in approximately a 6 month delay in completion of the protocol. In addition, obtaining a signed Operational Needs Statement (ONS) and Request for Service (RFS), to obtain permission for the fielding and activation of the equipment was delayed due to the PI being unfamiliar with the process to obtain approval to purchase and activate satellite communication equipment. This resulted in the ONS and RFS being written late in the cycle allowing insufficient time to obtain, activate and deliver the equipment to the user on the schedule initially proposed. The ONS for the Iridium phones was no longer necessary due to available equipment within USAMRMC that is to be used during the testing and validation phase. The ONS to obtain the INMARSAT terminals was approved in December of `03. Subsequent to the ONS approval a RFS was sent to the G3, Army, for authorization of activation. The delays resulted in a 2 month shift in the schedule. This is reflected on the Gantt chart filed separately with TATRC.
b. Operators. Due to the scheduling conflicts and training time availability there was a discontinuity of operators using the connectivity hardware and software packages resulting in errors in setup and operation. It is apparent that a robust and recurring training program must be developed and implemented to insure all those potentially called upon to use the equipment are properly trained.
c. TAML set-up. Though not a problem in our exercise we identified the need for open sky to facilitate uninterrupted INMARSAT communications. In a tactical situation the TAML would seek overhead cover to limit vulnerability through the use of tree cover or camouflage nets, both of which could impact INMARSAT signal strength. We recommend the procurement of longer antenna cables to allow for antenna placement further away from the iso-shelter where positioning may be more conducive to maintaining communication.
d. Band width limitations. Current bandwidth is at 64 Kb/sec costing in excess of $5.00 per minute. The bandwidth is insufficient to maintain voice, video and data communications simultaneously. To address this issue we limited our communications to no more than two of the communications means at a time. When troubleshooting inoperable equipment we used video and voice and when conducting on line troubleshooting or data interpretation we transmitted data only using an integrated chat capability in the network software. It is possible to increase the bandwidth in 64Kb increments with incrementally increased cost.
e. Secure communications. To address the need for secure communications in conjunction with the analysis of WMD samples, the protocol provided Iridium phones. The equipment remained the property of USAMRMC and has since been returned to them. Our assessment is that, though the possibility of requiring such communications is remote, such capability should be maintained at the Area Medical Laboratories (AMLs). Alternatives to the Iridium phones are a possibility and we leave the determination of need to the AML Chain of Command.

Appendix C. AMEDD-WIDE ADOPTION: Specific applications:

a. The TAML is undergoing reorganization to two AMLs. Both are outfitted with the basic equipment to allow for adoption of the telemedicine capability outlined here. Future operations will depend on the financial investment by the AMLs to support the cost of operations. Current rate using the INMARSAT for 64Kbs communications is approximately $5.00 per minute.
b. This could and should be adapted to the AMEDD remote clinics located in the Pacific rim as well as the western United States where company service reps are not always available and, in most cases, a sponsoring Medical Center has responsibility for maintaining services.
c. Civilian application for environmental surveillance teams, first responder portable labs, remote science stations as well as non-science computer training or troubleshooting should be explored.

NEXT STEPS: The TAML has been outfitted with two identical telechemistry equipment sets. This will allow for seamless integration now that the TAML has split into two AMLs. The USAMRICD has been supplied with all the communications equipment to allow for home site applications. All the equipment was purchased with the protocol money. The airtime needed to exercise the protocol was also funded out of the protocol. Now that the protocol has ended there is no future funding for operations from USAMRMC. The TAML and their parent unit will have to absorb any future operational costs if the capability is determined to be a value added.